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ABSTRACT

This curriculum guide for an electricity/electronics course was developed for high schools in Connecticut to demonstrate that technical courses can be used as part of the science requirement for an integrated academic and vocational curriculum. The guide provides a course description, course goals, recommended text and additional materials, 33 behavioral objectives (competencies) based on course content, 19 performance assessment statements, and outlines for the content of lessons for a 2-semester course. (KC)

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Cross Academic Credit
Electricity/Electronics & Science

Final Report

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Prepared For

Connecticut State Department of Education
Division of Vocational, Technical and Adult Education
Bureau of Vocational Services
Middletown, Connecticut

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The Norwich Free Academy

Norwich, Connecticut

Technology Education

Electricity-Electronics I VEE-601

Prerequisite : Open to lowers, uppers, and seniors.

Course Description: This course is designed to let students explore the concepts and techniques used in Electricity and Electronics. Students will study the properties of matter, atomic structure, electrical properties, DC, AC, and solid state electronics.

Course Goals: Upon completion of this course students will be able to understand the basic concepts in Electricity-Electronics. Students will demonstrate knowledge of electronic theory and laws through hands on experiences. Hands on experiences will include lab experiments (CES trainer), teacher prepared experiments, and residental wiring exercises.

Text: CES text-lab manual, CES Industries, Inc.

Additional Materials: CES educational lab training system, analog & digital multimeters, oscilloscope, IBM computer station, technology learning activities, design briefs, tests, and quizzes.

Content: Upon completion of the course students will be able to:

1. Give career examples and evaluate job opportunities that will be available to students if they pursue this field.

2. Identify and explain the structure of matter.
    a. Define molecule, compound, element, and the atom.
    b. Describe the electron theory.

3. Describe the atomic structure.
    a. Identify and draw parts of the atom.
    b. Differentiate between an electron, proton, and neutron.
    c. Define the law of charges.
    d. Demonstrate the ability to identify atomic weight and number by using the periodic table of elements.

4. Describe the properties of matter.
    a. Define mass, weight, volume, and inertia.

b. Differentiate between solids, liquids, and gasses.
c. Define energy and their classifications.

5. Describe the meaning of static electricity.

6. Identify different sources of electrical energy:
   Define electricity from light, heat, magnetism, mechanical pressure, friction, and chemicals.

7. Identify and define conductors, insulators, and semi-conductors.

8. Define electromotive force, resistance, current flow, and power.

9. Identify and construct DC circuits.

10. Demonstrate the ability to identify and apply Ohm's Law.

11. Demonstrate the ability to identify and properly use the following: ammeter, voltmeter, and ohmmeter.

12. Define electrical power and apply the power formula to given problems.

13. Identify, draw (schematic form), and construct the following circuits; series, parallel, and series and parallel combinations.

14. Identify natural magnets, artifical magnets, and electromagnets.

15. Explain the principles involved with the earth's magnetism.

16. Identify the north and south seeking poles of the magnet.

17. Demonstrate the ability to identify lines of magnetic force.

18. Identify and demonstrate magnets in series-aiding.

19. Identify and demonstrate magnets in parallel.

20. Differentiate between magnetic and non-magnetic materials.

21. Produce a state of temporary magnetism in a piece of soft iron.

22. Demonstrate the theory of electromagnetism by performing Oersted's experiment.

23. Identify and demonstrate the left hand rule.

24. Draw a schematic diagram of a door-bell circuit.

25. Draw a simple solenoid and describe how it operates.

26. Define alternating current.

27. Define the AC term's frequency, period, amplitude, and wavelength.

28. Draw the sine square, ramp, and triangle AC waveshapes.

29. Demonstrate the ability to identify and properly use an Oscilloscope.

30. Recognize electrical safety procedures concerning residental wiring.

31. Define appropriate National Electric Codes.

32. Identify and draw electrical symbols for basic residental wiring.

33. Design and produce simple wiring problems for single pole switch, three way switch, and duplex outlet.

Performance Assessment

1. Given a specified atom the student will be able to identify and draw parts of the atom.

2. Given an atomic number and weight the student will be able to identify the appropriate element.

3. Given magnets the student will be able to demonstrate the law of charges.

4. Given a comb and pieces of paper the student will be able to demonstrate static electricity.

5. Given a list of materials students will be able to identify them as conductors, insulators, and semi-conductors.

6. Given a diagram of two containers of water joined by a pipe the students will define the principles of electromotive force.

7. Given an ohmmeter and specified materials the student will be able to measure resistance and identify conductors, and ammeter.

8. Given an ammeter and specified materials the student will be able to measure flow.

9. Given the electromotive force and the current, the student will be able to solve the power equation.

10. Given two known values the student will be able to solve for the third, using Ohm's law.

11. Given a list of magnets the student will be able to classify into the following categories: natural, artificial, or electromagnets.

12. Given a map of the earth the student will be able to identify the magnetic and geographic poles.

13. Given a permanent magnet the student will be able to demonstrate north-seeking pole and identify south-seeking pole.

14. Given a bar magnet, iron filings, and sheet of paper the student will be able to produce a pattern by using magnetic force.

15. Given bar magnets of identical size the student will be able to arrange the magnets in series aiding.

16. Given bar magnets of identical size and shape the student will be able to arrange the magnets in parallel (laminate).

17. Given a bar magnet and various materials, the student will be able to identify magnetic materials from non-magnetic materials.

18. Given a permanent magnet, a piece of soft iron, a paper clip, and a nail, the student will be able to induce temporary magnetism in the piece of iron and pick up the nail.

19. Given one dry cell number 6; three feet of insulated AWG 20; 1 magnetic compass, the student will be able to produce an electromotive force, and determine the direction of the magnetic force.

Electricity-Electronics I

Curriculum Course Outline

Week No.	Description of Lessons	
1	Lesson 1 -	Organization & Class Rules
	Lesson 2 -	Safety Rules and Information
2	Lesson 3 -	Electrical Careers
	Lesson 4 -	Structure of Matter
3-5	Lesson 5 -	Atomic Structure
	Lesson 6 -	Properties of Matter
6-8	Lesson 7 -	Static Electricity
	Lesson 8 -	Sources of Electrical Energy
	Lesson 9 -	Conductors, Insulators, and Semi- Conductors
9-11	Lesson 10-	Electromotive force, resistance, current flow, and power
	Lesson 11-	Direct Current Circuits
12-18	Lesson 12-	Ohm's Law
	Lesson 13-	Ammeter, Voltmeter, and Ohmmeter
	Lesson 14-	Series, Parallel, and Combination Circuits (Review for Mid- Year Exam)

Electricity-Electronics I

Curriculum Course Outline

2nd Semester

1-4	Lesson 15-	Magnets (natural, artifical, and electromagnets)
	Lesson 16-	Earth's Magnetism
	Lesson 17-	North and South seeking poles
	Lesson 18-	Combining magnets
	Lesson 19-	Domain Theory
5-7	Lesson 20-	Electromagnetism
8-13	Lesson 21-	Alternating Current
	Lesson 22-	AC Terms - Frequency, Period, Amplitude, and Wavelength
	Lesson 23-	AC Waveshapes
	Lesson 24-	Oscilloscope
14-17	Lesson 25-	Residental Wiring
	Lesson 26-	National Electric Codes
	Lesson 27-	Wiring Problems
18	Review for Final Exam	